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Transition Toward a Sustainable Agriculture

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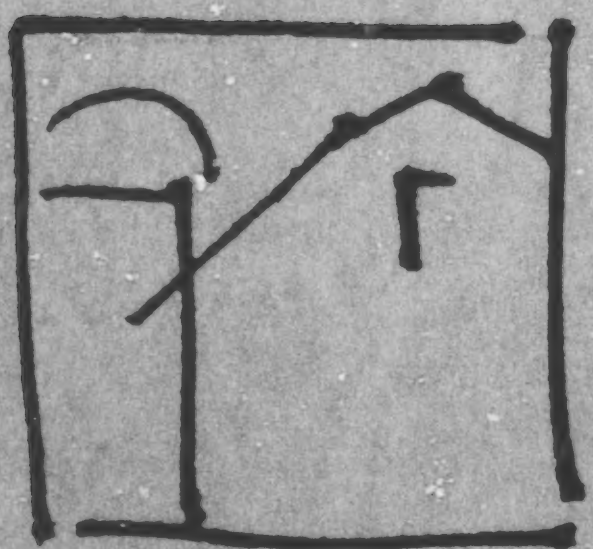

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Transition Toward a Sustainable Agriculture

Special Reference Briefs: SRB 91-04

Jane Potter Gates and Christophe Tant
Alternative Farming Systems Information Center

Alternative
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TRANSITION TOWARD A SUSTAINABLE AGRICULTURE

INTRODUCTION

This selected, annotated bibliography was prepared because the Alternative Farming Systems Information Center receives many inquiries about the process of conversion to a more sustainable system of farming. Such inquiries are frequently from farmers who are dissatisfied with the costs, both economic and environmental, of continuing to operate in the way they have been accustomed to farming.

Knowing that 'farmers learn best from other farmers', most of the citations in this publication are based on the writing and/or talks of farmers who have made the transition to low-input, sustainable agriculture, and who are sharing what they did, how they did it, where to be cautious, etc., using terms and expressions which are understandable, and practical.

It is our hope that the advice contained within the articles and books cited will be helpful to all those wishing to know more about how to make the "transition toward a sustainable agriculture".

For further information, please contact the following:

Alternative Farming Systems Information Center
National Agricultural Library, Room 111
10301 Baltimore Blvd.
Beltsville, MD 20705

telephone (301) 344-3559

TRANSITION TOWARD A SUSTAINABLE AGRICULTURE

PREFACE

Christophe M. Tant has been an intern with the Alternative Farming Systems Information Center (AFSIC) at the National Agricultural Library for the past two years (1989-1990). He is a native of France and a graduate of the Ecole d'Agriculture de Sainte Maure, 1987, with a degree in agronomy. Mr. Tant was also awarded a Certificate in Sustainable Agriculture, Summer 1987, from the University of California, Davis, CA.

A major portion of his work with the AFS Information Center has been focused on the need for substantive information about the problems inherent in, and the possibilities of, the conversion from conventional agriculture practices to a sustainable or low-input system.

Mr. Tant's interest is reflected in this publication, which contains citations to works examined by Mr. Tant and by Jane Gates, Assistant Coordinator of the Alternative Farming Systems Information Center. Credit for the annotations is due Mr. Tant, with Ms. Gates acting as editor, advisor and co-compiler.

TRANSITION TOWARD A SUSTAINABLE AGRICULTURE

01
"Agriculture in Transition"
R. Poincelot. Journal of Sustainable Agriculture. Binghamton, NY, Food Product Press. 1990. Vol. 1, No. 1, pp. 9-40. (NAL Call No. S494.5.S86S8)

This paper examines the overall problems faced by U.S. agriculture and the trend to adopt alternatives to commercial agricultural practices, as well as the solutions and possible scenario for the future. It is a paper addressed to anyone as well as farmers interested in a more general aspect of the issue. This new journal contains also other articles of substantial interest.

02
"Barriers to Conversion to Organic Farming Practices in the Midwestern U.S."
R. Blobaum. Environmentally Sound Agriculture. W. Lockeretz, ed. Selected papers from the 4th conference of the IFOAM (International Federation of the Organic Agriculture Movement). New York, Praeger Pub. 1984. Chapt. 16, pp. 263-278. (NAL Call No. S 604.5.E58)

This chapter examines potential barriers to conversion, using information on how they are perceived by organic farmers who overcame them. Data were obtained from a survey mailed to organic farmers in the Midwest.

03
"Barriers to Enter Organic Farming."
Organic Agriculture: Economic and Ecological Comparisons with Conventional Methods.
R. Oelhaf. Montclair, NJ, Allanheld, Osmun and Co. Pub. Inc. 1978. pp. 179-183. (NAL Call No. S605.5.066)

This section, inserted in a chapter entitled: "Estimating Production Costs of Organic Food from Farm Prices" briefly covers the difficulties encountered during the transition, but is primarily economically oriented.

04
"Changing to an Organic System."
Farming Organically. S. Mayall, ed. Stowmarket, England, The Soil Association. 1976. (NAL Call No. S605.5.M332). p. 14.

This is a brief guide providing practical information on the transition.

05
"The Conversion."
The Handbook of Organic Husbandry. F. Blake. Weltshire, G.B., The Crowood Press. 1987. Chapt.3, pp. 45-69. (NAL Call No. S605.5.B52).

This book, as its title indicates, is a handbook specifically for farmers. Chapter Three is a very practical tool for the new organic farmer, presenting a step-by-step approach to the conversion.

06
"Conversion to Biological Agriculture."
C. Aubert. Basic Technics in Ecological Farming. S. Hill, P. Ott, eds. IFOAM conference, Oct., 1978. pp. 22-25. (NAL Call No. S650.5.B39).

This paper examines the technical, financial and psychological factors that must be considered when converting to biological agriculture.

07
Converting to Organic Farming.
N. Lampkin, ed. Practical Handbook series. Berkshire, England, Elm Farm Research Center. 1986. 101 pp. (NAL: Cataloging in progress)

This paper is based to a large extent on proceedings of a seminar for farmers on the subject of converting to organic farming, organized by the Elm Farm Research Center. Its technical information is therefore relevant and very helpful to farmers contemplating the switch, who in fact might find it indispensable.

08
"Converting to Sustainable Farming Systems."
R. Andrews, S. Peters, R. Janke. Sustainable Agriculture in Temperate Zones. C. Francis, C. Flora, L. King, eds. New York, Wiley. 1990. Chapt. 10, pp. 281-313. (NAL Call No. S.494.S.S86S87)

This chapter presents an overview of the conversion. It is divided into sections covering key topics such as soil improvement, pest management and low-input experiments. A conclusion summarizes clearly the steps that should be taken when considering a conversion to sustainable farming practices. It includes over three pages of references.

09
"Crop Production During Conversion from Conventional to Low-Input Methods."
W. Liebhardt. Agronomy Journal, (American Society of Agronomy Publication). Fort Collins, CO, Colorado State Univ. March-April 1989. Vol. 81, No. 2, pp. 150-159. (NAL Call No. 4 Am 34P)

A research report presenting the results of a five-year cropping system experiment (conducted in Berks County, Eastern Pennsylvania-Comly silt loam soil) initiated in 1981 by the Rodale Research Center to study the transition from a conventional agricultural system using chemical pesticides and fertilizers to a low-input system. This report culminates with a discussion offering advice based on observations made through the experiment.

10
"The Dollars and Sense of Resource-Efficient Farming."
The Rodale Research Center's Conversion Project. Profitable Farming Now!. M. Brusko, et al., eds. Emmaus, Pa, Regenerative Agricultural Association. 1985. pp. 29-45. (NAL Call No. S605.5.P76).

This paper is addressed to farmers and discusses the Rodale Research Center's Conversion Project. It provides valuable and practical information.

11
An Economic Analysis of the Rodale Conversion Project: Overview.
M. Duffy et al. Staff papers series. Ames, Iowa, Dept. of Economics, Iowa State University. Feb. 1989. (unpublished), 19 pp. (NAL: Cataloging in process).

This is a research paper overviewing the economic aspect of the Rodale Research Center Conversion Project conducted on 15 acres in Berk County, Pennsylvania. The first part of the analysis examines project research plot data to estimate whether or not there were differences in returns among starting crops for rotation used in the conversion. The second part compares the returns from the dominant rotation in each of the three alternative production systems selected for this experiment.

12
"Effects of Conversion to Organic Agricultural Practices on Soil Biota."
M. Werner and D. Dindal. American Journal of Alternative Agriculture. Greenbelt, MD, Institute of Alternative Agriculture. 1990. Vol. 5, No. 1, pp. 24-32. (NAL Call No. S605.5.A43)

This is a research paper comparing the population of soil fauna at the fifth year of a conversion to organic agricultural practices under different production systems (organic-manure, organic-legumes, conventional system). The experiment was a part of the Rodale Research Center conversion project started in 1981.

13
Etude Technique et Economique de Neuf Exploitations Agricoles Pratiquant L'Agriculture Biologique.
Paris, France, Institut pour la Recherche et L'Application en Agriculture Biologique. 1982. 73 pp. French. (NAL Call No. S605.5.E8).

This report was presented to the French ministry of agriculture upon its request. It is a technical and economic study of nine biological farms. Each study provides information about every aspect and evolution of the cropping system(s) from the time the conversion started (such as rotation...). The conclusion covers the common motivations of farmers and their psychology as well as the improvements within the whole organism that is the farm. A translation of the paper's conclusion appears as Appendix A of this bibliography.

14
"Farmers Advise on Changing to Sustainable Practices."
The Land Stewardship Letter, Marine, MN, Land Stewardship Project. Spring 1990. Vol. 8, No. 2, pp. 66-67. (NAL Call No.HD1485.L25.L25)

A two-page article presenting short practical information for farmers interested in changing to sustainable agricultural practices.

15

Farming with a Future: Making and Marketing the Transition.
C. Wyman and L. Vieiri, eds. Proceedings of the conference held in Fresno, CA, Nov. 7, 1986. Small Farm Series. Davis, CA, Small Farm Center, Coop. Ext., Univ. of CA. 65 pp. (NAL Call No. S451.C2F3).

This paper presents lectures given at the conference by farmers, professionals and scientists involved in sustainable agriculture. Farmers' experiences are appropriately used as an introduction and key elements of the conversion are later examined.

16

"Farm-scale Agronomic and Economic Conversion from Conventional to Sustainable Agriculture."
R. MacRaye et al. Advances In Agronomy. N. Brady, ed. San Diego, CA, Academic Press. 1990 Vol. 43, PP 155-198. (NAL Call No. 30 AD9)

The well conducted approach of this paper (based on a broad and diverse 8 page bibliography) makes it very explicit and therefore very useful to the entire community, and most specifically to every farmer considering the challenge of conversion. This report presents valuable topics such as: attitudes toward conversion and rationale, length of the conversion period, key elements in developing an action plan, conversion without animals, implications of widespread conversion.

17

From the Ground Up: Wisconsin Sustainable Farmers Tell of Their Practices and Vision.
M. Irvin., ed. Madison, WI, Madison area Technical College-Wisconsin Dept. of Agriculture Trade and Consumer Protection. 1990. 68 PP. (NAL: cataloging in process).

This book is the echo of ten farmers experiencing a different way of farming. They share their experiments, their lives and emotions, which makes this book a resource of ideas and inspiration to other farmers.

18
"How to Convert an Ordinary Farm into a Biodynamic Farm."
Soil Fertility: Renewal and Preservation. E. Pfeiffer. Sussex, England, The Lanthorn Press. 1983. Chapt.8, pp.69-88. (NAL Call No. S605.5.P5)

This chapter discusses the difficult conversion to biodynamic farming practices. It is based on basic but important knowledge gathered from farmers' experiences but also on forgotten common sense.

19
"The Inside Story on the Conversion"
R. Harwood. The New Farm. Emmaus, Pa., Rodale Press. July-Aug. 1981. Vol. 3 (5), P.P. 52-53. (NAL Call No. S1.N32).

This article introduces the Rodale Research Center's conversion project, including the proposed rotation schedule for 1981-1985. It raises preliminary questions a farmer considering the switch might be confronted with.

20
"Making the Transition to Low Input Agriculture: A Farmer's Perspective."
J. Andrew III. American Journal of Alternative Agriculture. Greenbelt, MD, Institute of Alternative Agriculture. Winter 1987. Vol. II, No. 1, pp. 17-18. (NAL Call No. S605.5.A43)

This paper was presented by an Indiana farmer at the I A.A. symposium on ground water protection. It focuses on the potential for avoiding contamination by agricultural chemicals. March 3, 1987, Washington, D.C.

21
"Observation on a Mixed-Farm During the Transition to Biological Husbandry"
D. G. Patriquin et al. Biological Agriculture & Horticulture. Herts., England, A.B. Academic Publishers. 1986. Vol.4, No. 2, pp. 69-154. (NAL Call No. S605.5.B5).

This report presents a study of the conversion from a conventional to a alternative farming system, started in 1979, on a mixed-farm (35 hectares-2100 laying hens-pasture-hay) located in Nova Scotia, Canada. This study has been conducted on a whole, functioning system, examining the overall evolution of the transition and more specifically the evolution of soil nutrients.

22
"Plan de Conversion."
Encyclopedie Permanente D'Agriculture Biologique. C. Aubert. April 1974. Vol. 2, pp. 421-422. French. (NAL Call No. S605.5.E5.V2)

This is a paper included as a chapter of the Permanent Encyclopedia of Biological Agriculture published in French. It proposes a methodical approach of the conversion which makes it useful to farmers. A translation of this paper appears as Appendix B of this bibliography.

23
"Problems Confronted When Making the Transition to Ecological Agriculture."
A. Schereski, E. Potter, A. Moore. Practical Alternatives to Chemicals in Agriculture. Proceedings of the conference (Oct. 30-31, 1978) held at Echo Valley Centre, Fort San, Saskatchewan, CAN. Regina, CAN, Univ. of Regina. pp. 11-19. (NAL Call No. S605.5.P7).

This paper consists of lectures given at the conference by three farmers who had undertaken the transition. It is therefore based on their experiences with a particular emphasis on weed control (such as wild oat).

24
"La Reconversion a L'Agriculture Biologique."
Nature & Progres (special issue), France. Winter 1989-90. No. 110-111, pp.8-64. French. (NAL: on order)

This special issue is dedicated to the conversion in France. It fully covers the subject, presenting barriers to the conversion. It is composed of different interviews and articles written mostly by professionals.

25
Research Agenda for the Transition to a Regenerative Food System.
R. Harwood and P. Madden. The Cornucopia Project. Emmaus, PA, Rodale Press. 1982. 22 pp. (NAL Call No. HD 1761.H37)

This paper, addressed to researchers but also to anyone involved with the switching to an alternative agriculture, examines the necessary research from which farmers facing this challenge could benefit greatly.

26

Reshaping the Bottom Line: On-farm Strategies for a Sustainable Agriculture.
D. Granatstein. Stillwater, MN, Land Stewardship project. 1988. pp. 6-8. (NAL Call No. S494.5.5S86G7)

This is a paper presenting a sustainable approach to agriculture, helping the farmer rethink agricultural practices. It also examines the necessity of a shifting in government programs toward policies that support sustainable agriculture.

27

Rushall: The Story of an Organic Farm.
B. Wookey. New York, Basil Blackwell Inc. 1987. 209 pp. (NAL Call No. S605.5.W58)

This book presents an example of an organic farm in England. Chapter 2, "Why We Converted", and Chapter 5, "How We Converted", explain the farmers' motivations for growing organically and the difficult transition process they have undertaken.

28

A Study Of 11 Wisconsin Organic Farmers' Characteristics, Production Methods and Information Seeking Behavior.
N. Brendlinger. Madison, WI, University of Wisconsin. 1984. 122 pp. (NAL Call No. S605.5.B7)

This paper is a thesis submitted for the degree of Master of Science in agricultural journalism. A case study approach was used to get in-depth information about what makes people become organic farmers and what ideas, beliefs and farming practices they share, as well as tracing their information seeking behavior.

29

Switching to a Sustainable System:Strategies for Converting from Conventional/Chemical to Sustainable/Organic Farming Systems.
F. Kirschenmann. Windsor, ND, The Northern Plains Sustainable Agriculture Society. (NPSAS). 1988. 18 pp. (NAL Call No. S494.5.S86K5).

This booklet is written by a farmer for farmers. It proposes an alternative to conventional farming practices, derived largely from farm-based experience in the state of North Dakota. Because of its careful and step-by-step approach to the transition, this is a very helpful document to any farmer who is contemplating the switch.

30
The Transition Document:Toward an Environmentally Sound Agriculture.
H. MacCormack, et al. Oregon, Oregon Tilth Research & Education Committee, . 1988. 77 pp. (NAL Call No. S605.5.M32)

This is one of the most complete and explicit documents on the transition. It is divided into ten chapters addressing the critical questions, and each chapter includes a very useful bibliography.

31
"The Transition to Organic Agriculture: A Multi-year Simulation Model of a Pennsylvania Farm."
S. Dabbert, P. Madden. American Journal of Alternative Agriculture. Greenbelt, MD, Institute of Alternative Agriculture. Summer 1986. Vol.I, No. 3, pp. 99-107. (NAL Call No. S605.5.A43).

This paper is the study of a multi-year simulation model investigating the trend in income of a 117 hectare crop-livestock farm in Pennsylvania during the transition process.

32
"Toward Sustainable Agriculture."
Agroecology: the Scientific Basis of Alternative Agriculture. M. Altieri. Boulder, CO, Westview Press. 1987. PP. 195-199. (NAL Call No.S589.7.A47)

This chapter is divided in two parts. The first section lists some of the problems of modern agriculture, the second discusses the transition from a general to a more specific view, and provides recommendations for actions which would accelerate the change process.

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Appendix A

ETUDE TECHINIQUE ET ECONOMIQUE DE NEUF EXPLOITATION AGRICOLES PRATIQUANT L'AGRICULTURE BIOLOGIQUE

***

INSTITUT POUR LA RECHERCHE ET L'APPICATION EN AGRICULTURE BIOLOGIQUE

—

TRANSLATION OF THE ANALYSIS AND CONCLUSION OF THE TECHNICAL AND ECONOMICAL STUDY OF NINE ORGANIC FARMS PRESENTED TO THE FRENCH MINISTRY OF AGRICULTURE IN 1982.

—

Citation No. 13

Etude Technique Et Economique De Neuf Exploitations Agricoles Pratiquant L'Agriculture Biologique

INSTITUT POUR LA RECHERCHE ET L'APPLICATION EN AGRICULTURE BIOLOGIQUE
PARIS. FRANCE. 1982

* * *

Analyses and conclusion of the technical and economical study of nine organic farms presented to the French Ministry of Agriculture in 1982.

I. General technical characteristics used in organic agriculture

Similarities among farms

a) Rejection of synthetic hydrosoluble fertilizer
b) Land occupied as much as possible by plants
c) Large introduction of legumines in the rotation
d) Recycling of farm residues and by-products (composting)
e) Avoidance of chemical herbicides and pesticides
f) Increase of soil tillage, especially superficial tillage which reduces weed population

These general data slightly changed with specific farms which need to adopt a field-by-field rotation.

II. Farmers' motivations to change farming practices

Common motivations observed in the study:

a) Farmers' worries to handle increasing amounts of chemicals after observing soil degradation as well as crops, livestock and human health degradation, which together makes the whole biological organism of the farm
b) Farmers' worries about the future of their soil and its fertility, and their long term relationship with their customers because of the quality of their products.
c) Those who are farming conventionally are looking for alternative practices to get away from economical problems
d) Search for an autonomy preventing economical and physiogical problems

After the first year or after a few years a change seems economically beneficial; farmers observe a reduction of general costs and pathology as well as a stability of the yields.

III. Psychology of these farmers

This report gives the opportunity to mention that this "non-conformism" is the result of farmers, often isolated, who started to doubt and took the challenge to leave the main stream by taking responsabilities in all respects for the biological values of the food chain from the soil to human species.

IV. What do they get beside economical equilibrium?

They respect, without being totally informed but determined, primary elements and needs:

a) Reduction of diverse pollutions of water as well as food
b) Health of plant, animal and human populations
c) Soil biology in relation with its fertiliy
d) Natural fixation of atmospheric nitrogen (energetic independence)
e) Necessity to restitute micro-elements to the soil
f) Economical equilibrium benefiting from:
    1- Reduction of cropping costs (expenses from energy uses)
    2- Reduction of: . weed and pest control costs
    . livestock sanitary costs
g) Sustainability of output produced: yields are comparable with conventional practices

V. Where does this state of economical health come from?

Among the economical observations from this study two reveal new facts:
1°) Most of the organic farms of this study sell their products through conventional marketing channels by default of organized channels adapted to their need. They sell therefore their commodities at market prices. The profitability is consequently the result of an efficient organic agriculture and a better structure of its production means rather than better commodity prices.

2°) Risks occuring the first year of the transition which showed in the past to be sometimes disastrous for some could generate discouragements and scepticism to the idea of converting to organic farming systems.
This study however shows that the risks can be minimized with any farming system, non-livestock farming systems included, for which the conversion is more of a challenge

VI. General conclusion

The gathering of data from diverse farms located in many different regions of France shows the following results:

1°) Comparable yields to conventional farming systems (regional comparisons)

2°) Reduction or elimination of pathological infestations

3°) Avoidance of almost every external way of pest and parasite control which explain the following point:

4°) A farm economical health resulting from the adoption of an organic farming system

As a result three farms of this study are some of the leading farms of their Farm Management & Accounting Center (Centre de Gestion).

As a final conclusion, organic agriculture is a more efficient way of farming to reach the economical as well as biological goals imposed by today's circumstances.

Appendix B

PLAN de CONVERSION

***

ENCYCLOPEDIE PERMANENT DE L'AGRICULTURE BIOLOGIQUE

(Vol. II, PP. 421-422. 1974)

***

C. AUBERT

—

TRANSLATION OF THE CHAPTER TITLED "*PLAN DE CONVERSION*" PRESENTING A METHODICAL APPROACH TO THE TRANSITION FROM CONVENTIONAL TO ALTERNATIVE FARMING PRACTICES

—

Citation No. 22.

PLAN de CONVERSION . C. AUBERT

ENCYCLOPEDIE PERMANENT DE L'AGRICULTURE BIOLOGIQUE

(Vol. II)

***

CONVERSION PLAN

Prevention against toxic residues...

I
...Polluting water...

Water for irrigation

Vegetable and fruit growers irrigating their crops should be concerned by the quality of the water they use. Water from rivers and groundwater is more and more polluted. Pollution can be originated from industry or agriculture. One of the most important threat comes from the pollution from pesticides used by neighboring farmers.

It is therefore very important, when doubts occur, to analyze the water in order to discover any residues from pesticides.

Drinking water

Risks of pollution might occur when using well water for livestock. Here again analyses are necessary to detect any residues of pesticides and high levels of nitrates which could be fatal to livestock.

...Brought by air...

Sprayings from neighbors

Organic farms surrounded by commercial farms are at risk of being contaminated.

The only way to prevent pollution from pesticides spraying by neighboring farmers is to plant dense and high bushes around the fields especially where the winds are dominant.

It would be also beneficial to approach neighbors requesting them not to spray when winds are not favorable.

Vehicle exhaust fumes

Fields located on the edges of roads and highways are very polluted by lead from exhaust fumes. Lead levels (lead free fuel has been just recently introduced in France) are sometimes very high in cultivated crops and forage. Bushes are very efficient but when possible stay away from roads with major traffic.

Industrial pollution

Unfortunately farmers are powerless against industrial pollution which can be extended to a large area. Plants dealing with fluoride mineral are among the most dangerous. The only way, whenever possible, is to avoid these areas.

3

...Associated to reused packagings...

Farmers must avoid reusing any pesticide or pesticide added fertilizer containers or packagings

They will also have to be careful of the origins of seed bags. Bags having contained commercial seeds will be avoided

4

...Contaminating bought livestock...

Cases occurred where organic farmers were accused of selling milk contaminated with pesticides they never used while farming conventionally. The pesticides found were in fact chlorinated pesticides from cows bought previously by the farmers. Cows store pesticides in their fat, it is therefore likely that a pesticide be found in the milk several month or years after its ingestion, especially if a weight loss occurs. Organic farmers will therefore buy their livestock essentially from other organic farmers.

5

...Contained in animal manure, straw and other bought organic matter...

Organic farmers who do not produce enough straw or animal manure are forced to buy it, and this more likely from conventional farmers because other organic farmers rarely if ever sell it. Farmers will buy straw from a supplier who sprays minimally and who uses few or none persistent pesticides or herbicides. Composting, however, helps eliminate most of the chemical residues, and a number of organic farmers, in fact, buy straw from conventional farms without observing any incident during the growing cycle of the crops and without finding any residue in the harvest.
On the other hand, if residues occur it will be wise to have the straw analyzed.

In the specific case of hen manure, it is essential it be analysed to discovered any residue from antibiotics which could have a negative impact on soil microbial activity.

6

...Contained in forage and feed...

The problem here is the same as for organic fertilizers. A farmer forced to buy forage or feed from a conventional farmer or commercial supplier would have to look for the least polluted ailments. He, for example, would avoid buying hay from pasture or forage weeded with herbicides.

7

...Contained in insecticidal paints...

Organic farmers would obviously not use paint containing insecticides for livestock buildings. Unfortunately, chlorinated insecticides (now banned) contained in paints diffuse in the atmosphere many years after their use.
When contemplating a conversion or buying a farm, one would therefore have to clean the walls and covers them with a material that prevent any diffusion of the chemical(s).

8

...Remained in the soil...

Some residues from chlorinated insecticides, such as Aldrin and Dieldrin, can persist in the soil several years, and in some cases more than ten years after being sprayed. If these particular pesticides had been used a soil analysis is necessary to detect any residues, and upon the results products from the harvest may not be commercialized as organic until 'disappearance' of the residues. The only way to accelerate the process of degradation is to improve the soil biological activity by using the fertilization and tillage methods used in organic farming.

Conversion plan

1

Analyzing the initial situation

Switching from a conventional to a biological farming system is a real challenge. The conversion must be handled in a way that it does not endangered the financial equilibrium of the farm.

The length of the conversion depends on the initial situation.

To know it well, and especially to evaluate the biological state of the soil, it is necessary to examine two points.

...Chemical and biological state of the soil...

The examination would include:

- Complete chemical analysis of macro-elements and principal micro-elements
- Biological analysis showing the level of the soil biological activity
- Research of pesticides residues if pesticides had been used during the last ten years. For some very persistent insecticides such as Aldrin, Dieldrin and DDT analysis is necessary if there is doubt of their use for the last fifteen years.

...Cropping systems and tillage methods used for the last ten years...

This study and especially the one concerning fertilization and rotation would provide valuable information, complementing the analysis, on possible unbalances in the soil.

Land farmed conventionally with massive quantities of chemical fertilizers and unbalanced rotation (cash grain-monoculture) is more likely to have a low level of humus and some minerals. It would be therefore necessary to take this in account when establishing the rotation and fertilization during the transition period.

2

Introducing new crops

The choice of the rotation should follow the principles of biological farming systems

Unless the initial situation is exceptionally favorable (livestock + pasture) it would be necessary to introduce new crops.

* Annual legumes:
  - (clover, alfalfa, vetch, ...) planted alone or associated
  - legumes for the production of seeds (clover, alfalfa) or human (peas, beans) and livestock (forage peas, ...) consumption
* Temporary pasture with a diversified flora:
  - Introduction of temporary pasture in the rotation is not necessary if the proportion of annual legumes is sufficient, but pasture remained the best way to improve the soil
* Row crops could be used as cleaning crops.

3

Eliminate or reduce some crops

Following are some crops to reduce during the conversion period:

- Corn, which keeps the soil exposed for a long period, and because it lowers soil nutrient stock when it is planted too often on the same field.
- Sugar beet, which is often harvested in humid conditions (fall season) with heavy equipments can easily destroy soil structure especially when it is already unstable.

4

Fertilization plan

Unless the situation is exceptional it is not advised to switch directly from a conventional to a biological fertilization plan.

Only the results from analysis and knowledge of fertilization practices before making the switch can help determining the appropriate fertilization to be used during the conversion period.

The fertilization plan could be established with the assistance of the farm advisor or county agent specializing in agricultural biological systems.

5

Eliminate chemical fertilizers

The use of chemical fertilizers would be totally avoided on the field(s) to be converted the first year. It would be however possible to use in some cases Sodium Nitrate of Chili. This Nitrate, although it is a natural product, is not accepted in biological agriculture because of its Nitrate form making its Nitrogen too quickly available to plants. But during the conversion period however this fertilizer would help in making the transition from chemical Nitrogen to biological fertilization in soil deficient in humus or having a weak biological activity. The quantity used should not exceed 300-400 Kilograms/hectare. Nitrate of Chili would be generally used for spring cereals, with a dosage of about 200 kilograms/hectare.

6

Fertilization improving soil nutrient stock

Fertilization improving soil nutrient stock at the beginning of the first year would be to correct:

- Possible natural soil deficiencies
- Unbalances caused by a previous chemical fertilization

These deficiencies and unbalances should be reported on the analysis for macro-elements and the main micro-elements.

Most of the soils farmed conventionally for several years present the same unbalances:

- Excess of potash and phosphate
- Deficiency of more or less importance of magnesium and micro-elements

Quantities used would therefore be more important during the transition period for:

- Magnesium: natural Magnesium Silicate, primary rock (basalt, granite...)
- Micro-elements

Moderate quantity of natural phosphate, and natural potash could be done upon results of analysis.

The first year it would be possible to spread important quantities of natural fertilizers abundant with micro-elements. Magnesium and primary rocks which provide silicate, element neglected by conventional agronomy, are very suitable. Lime supply such as *lithotame* (calcareous algae) should be handled with care because any excess could induce a blockage of some micro-elements making them unavailable to the plant.

The second year the fertilization used to improve soil fertility will be repeated with reduced quantities.

7

Use a careful organic fertilization

Do not 'overfeed' the soil. Massive spreading of manure could have negative short term effects. A soil deficient in humus and having a weak biological activity is unable to quickly respond and transform massive quantities of fresh organic matter which could be toxic to roots.

On the other hand well-decomposed compost (mature compost - earthlike) could be spread without limitation of quantity because it is made of transformed ('predigested') organic matter beneficial to the development of the plant.

8

Using a plan

* Proceed step-by-step: A conversion must always be progressive:

One part of the farm will be converted every year. The length of the conversion depends on farm structures and on the state of soil fertility.

* Proceed very progressively especially if the initial situation is bad:

- Farm with no or little livestock
- Soil 'mistreated' with chemicals (use of high quantities of chemical fertilizers or pesticides)

* Convert first the pastures, which would rapidly improve livestock health and forage production

* Start converting every field supporting a temporary pasture or an annual legumes which prevents risk of yield losses.

Ranches (farms with primary livestock)

Farms with about 50% of the land used for permanent pastures or forage crops could convert:

- permanent and temporary pastures
- annual crops planted after temporary pastures or forage legumes

The conversion of the whole farm could be done within 2-3 years, or the first year if the soil biological activity is very good.

Polycultural farming systems

Farms with about 1/3 of the land used for temporary pastures or forage crops would follow the same principles as above. The whole farm would be converted once all of the fields have been planted with legumes or forage crops (3-4 years).

Farming systems without livestock

It is also possible to quickly convert the farm but the risk of yield losses is real.

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